SILVER NANOPARTICLES OBTAINED BY SONOCHEMICAL ROUTE

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INTRODUCTION

BASIC EFFECTS OF SONOCHEMICAL SYNTHESIS

Physical & Chemical Effects of ultrasound

Nucleation
- **Growth**
- **Implosion**

- Hot spot
- Shock Wave
- Micro jet

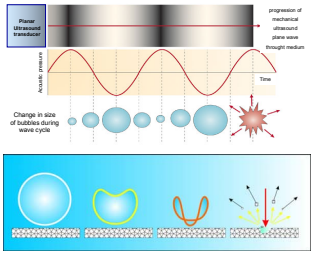
Locally developed parameters:
- T~ 5000ºC
- p ~1000 atm
- ΔT~10^{10} K/s

Physical effects

Homogenization
Emulgation
Mixing
Deagglomeration

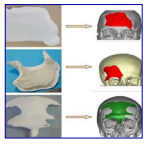
Chemical effects

Formation of active radicals of:
Precursors
Solvents
stabilizers



NANOPARTICLE FORMATION

APPLICATION OF MATERIALS WITH ANTIBACTERIAL PROPERTIES



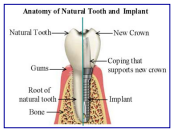
Implant fabrication

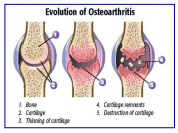
NANOMEDICINE

Treatment of dental infections

Prevention

Therapeutics





RESULTS

MORPHOLOGICAL PROPERTIES

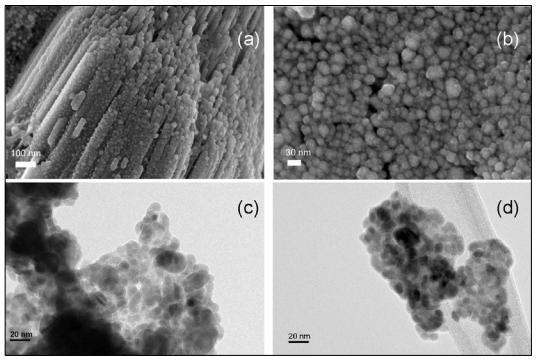


FIGURE 1: Silver nanoaparticles

FIGURE 1

Morphology of sonochemically obtained silver shows aggregated sphere-like nanoparticles with axial spatial orientation . Particles are up to 30 nm in size.

FIGURE 2

Morphology of sonochemically obtained silver/hydroxyapatite composite particles shows individual sphere-like silver nanoparticles distributed onto the surface of plate-like hydroxyapatite. Silver particles are up to 10 nm in size, while hydroxyapatite plates have submicrometre dimensions.

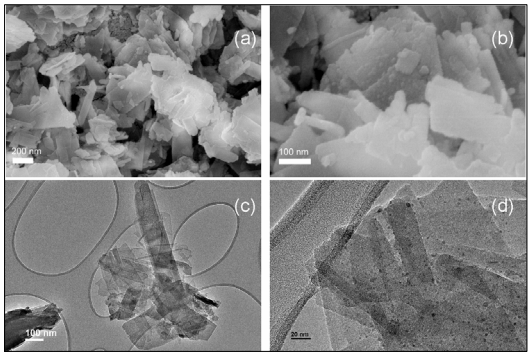
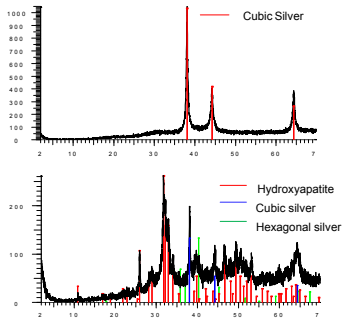


FIGURE 2: Silver /Hydroxyapatite composite particles

IDENTIFICATION



DISCUSSION and CONCLUSION

Urea, applied as a capping agent of silver, promote formation of silver complex which decomposes at 300°C.
As a result:
- **Monophase Ag with the structure of cubic silver forms sphere-like morphology with particles up to 30 nm in size.**
- **In the case of HAp/Ag composite, cubic and hexagonal phases of silver were obtained. Silver particles had sphere-like morphology with sizes up to 10 nm. They were attached to the surface of micrometre-sized HAp plates.**
- **Chemical interactions between HAp and silver-complex are observed indicating tamplating role of HAp in mechanism of silver nanoparticles formation.**

HAp surface contributes to Ag particles growth by influencing morphological and structural parameters of Ag within HAp/Ag composite.

CHEMICAL INTERACTIONS

Hydroxyapatite OH- group vibrations